## REMARKS

In response to the Office Action mailed June 12, 2009 applicants request entry of the foregoing amendments, consideration of the following remarks and reconsideration of the rejections set forth in said office action.

Claims 1-6, 8-10, 14-25, 27-29 and 33-37 were rejected under 35 USC 102(b) as being anticipated by Liesen et al. (US 5955405) herein after Liesen et al.'405. Applicants submit that Liesen et al. '405 fails to anticipate each and every feature of the present invention.

The present invention relates to additives and thickeners in oil-based compositions which comprise acrylic block copolymers synthesized by a controlled radical process. The acrylic block copolymers are synthesized by a controlled radical process are especially useful as viscosity index improvers in lubricating oil. The oil-based compositions of the present invention contain a controlled architecture block copolymer having at least one acrylic block. Block copolymers of the present invention are those formed by a controlled radical polymerization (CRP). They differ from random copolymers that may contain some blocks of certain monomers related either to a statistical distribution, or to the differences in reaction rates between the monomers. In these random polymerizations, there is virtually no control over the polymer architecture, molecular weight, or polydispersity and the relative composition of the individual polymer chains is non-uniform. When a copolymer segment is synthesized using a CRP technique such as nitroxide-mediated polymerization, it is termed a gradient or 'profiled' copolymer. This type of copolymer is different than a polymer obtained by a traditional free radical process and will be dependant on the monomer composition, control agent, and polymerization conditions. For example, when polymerizing a monomer mix by traditional free radical polymerizations, a statistical copolymer is produced, as the composition of the monomer mix remains static over the lifetime of the growing chain (approximately 1 second). Furthermore, due to the constant production of free radicals throughout the reaction, the composition of the chains will be non-uniform. During a controlled radical polymerization the chains remain active throughout the polymerization, thus the composition is uniform and is dependant on the corresponding monomer mix with respect to the reaction time. Thus, in a two monomer system where one monomer reacts faster than the other, the distribution or 'profile' of the monomer units will be such that one monomer unit is higher in concentration at one end of the

polymer segment. The copolymers of the invention are acrylic block copolymers. By acrylic block copolymer, as used herein, is meant that at least one block of the copolymer is formed entirely or almost entirely from one or more acrylic monomers. The acrylic block contains at least 90 mole percent of acrylic monomer units, preferably at least 95 mole percent, and most preferably at least 98 mole percent.

The inventors discovered that the use of acrylic block copolymers synthesized by a controlled radical process as additives in oil systems provided a surprising and unexpected increase in viscosity in comparison to homopolymers or random polymers. The acrylic block copolymers synthesized by a controlled radical process of the present invention exhibit a divergent behavior with concentration leading to the thickening. See figure 1, (example 6). Example 6 shows that homopolymers or non-controlled copolymers exhibit a linear increase in oil viscosity with concentration while block copolymers in accordance with the present invention exhibited a pronounced non-linear increase. Applicants submit that this property of the present invention is not anticipated by Liesen et al. '405.

Liesen et al. '405 discloses copolymers containing very specific monomer proportions (ex: see 2:23-29). The disclosure mentions they are produced by free radical or by anionic polymerization. Liesen et al. '405 does not disclose nor teach the use of "controlled" free-radical polymerization. Liesen et al. '405 teaches a method to make and use a non-dispersant polymethacrylate copolymer comprising a specific monomer composition mixture. The polymers described/exemplified were prepared by a free-radical (non-controlled) process. The copolymers disclosed by Liesen et al. '405 are analogous to the homopolymers in the present application used as a comparative example, see Figure 1 (example 6). As per Figure 1, homopolymers or non-controlled copolymers as described by Liesen et al. '405 show a linear increase in oil viscosity with concentration. The block copolymers of the present invention made by a controlled fashion exhibit a divergent behavior with concentration leading to the improved thickening.

The examiner notes that in Liesen et al. '405, block copolymers are added to a base oil (column 5 lines 60-70). Applicants acknowledge that Liesen et al. '405, at column 5 lines 60-70 describes the addition of polymer to oil (not necessarily block copolymers). However, the copolymers of Liesen et al. '405, as exemplified, are random, not block copolymers, not prepared via a controlled process. The description

at lines 8-15 of Liesen et al. '405 describes monomer addition processes to control PDI. Applicants acknowledge that Liesen et al. '405 mentions that block copolymers "could be made" by anionic methods (column 4 lines 8-68). However, applicants submit that such copolymers are not exemplified anywhere in Liesen et al. '405 and the unexpected advantage of such block copolymers discovered by the present inventors is not disclosed.

Applicants submit that such block copolymers are not exemplified in Liesen et al. '405 because such copolymers are not readily obtainable via the process disclosed therein. The "living" polymerization of an all acrylic system can only be carried out with many difficulties and many unwanted side reactions. That is, the polymerization process disclosed by Liesen et al. '405 cannot readily produce all of the products described therein. Attempts to use the processes Liesen et al. '405 discloses, to make block copolymers will result in copolymers that are impure and performance will be minimized.

Applicants submit that were a person of skill in the art to follow the process disclosed by Liesen et al. '405 to try to make block copolymer, the materials would not provide the advantages provided by the present invention. Liesen et al. '405 discloses and exemplifies a process of adding all 3 monomers and polymerizing anionically to make a low PDI meth(acrylate) copolymer. However, applicants submit that to make a block copolymer by sequential monomer addition in a comparable process, many side reactions and termination reactions will result and the polymer desired will not be readily obtained.

As described in the present application, such as at paragraph [0011], block copolymers made by anionic polymerization of methacrylates will exhibit many issues/drawbacks. Polymers prepared via living anionic polymerization suffer from drawbacks, such as, ineffectiveness at temperatures above – 20 °C, poor co-polymerization between polar and non-polar co-monomers, and the inability to use monomers that can be easily deprotonated. Therefore functional monomers cannot be incorporated, and the co-polymerization of monomer mixtures can be problematic and/or unusable. Furthermore, such a process can be expensive and difficult or impractical to carry out on an industrial scale as bulk or emulsion techniques cannot be used, extremely pure reagents are necessary (even trace amounts of protic material inhibits polymerization), and an inert atmosphere is a requisite.

Applicant respectfully submit that Liesen et al. '405 fails to anticipate the present invention and that the

rejection should be withdrawn.

Claims –10, 14-29 and 33-37 were rejected under 35 USC 103 (a) as being unpatentable over Liesen et al. '405 in view of Lai et al. (US 6281311) hereinafter Lai et al. '311. Applicants submit that Liesen et al. '405 and Lai et al. '311 alone or in combination fail to render obvious the present invention.

Lai et al. '311 discloses a polymerization process for the preparation of acrylate containing homopolymers of block copolymers comprises heating a mixture of a free radical initiator, a stable free radical agent, and a polymerizable monomer compound to form a thermoplastic resin or resins with a narrow polydispersity. The stable free radical agent is a piperazinone or morpholone based nitroxide or any adducts thereof. The disclosure of Lai et al. '311 is limited to the use of the nitroxides to form thermoplastic resins. Applicants submit that there is no disclosure, either express or implied of the use of nitroxides to form block copolymers for use in lubricating oils. Further, there is no teaching of the surprising efficacy of using acrylic block copolymers synthesized by a controlled radical process in lubricating oil discovered by the present inventor. Applicants submit that as discussed above, Liesen et al. '405 fails to disclose the use of acrylic block copolymers synthesized by a controlled radical process in lubricating oils. Applicants submit that there is nothing other than the teaching of the present invention of the unexpected advantages of acrylic block copolymers synthesized by a controlled radical process that would lead to use of the polymerization process for making thermoplastic resins of Lai et al. '311 as a replacement for the process to form specific copolymers of Liesen et al. '405. The present invention is directed to the discovery of the advantages in lubricating oils of acrylic block copolymers synthesized by a controlled radical process. Applicants submit that neither Liesen et al. '405 nor Lai et al. '311 alone or in combination render obvious such a discovery.

Claims 11-13 and 30-32 were rejected under 35 USC 103(a) as being unpatentable over Liesen et al. '405 and Lai et al. '311 and Beimesch '696. Applicants submit that neither Liesen et al. '405 nor Lai et al. '311 nor Beimesch '696 alone or in combination render obvious the present invention.

Beimesch '696 discloses a hydraulic fluid based upon synthetic hydrocarbon basestocks and having improved low temperature properties. Applicants submit, that as with Liesen et al. '405 and Lai et al. '311, Beimesch '696 fails to disclose either expressly or by implication a lubricating oil composition

which incorporates acrylic block copolymers synthesized by a controlled radical process to provided a surprising and unexpected increase in viscosity in comparison to homopolymers or random polymers. The disclosure of Beimesch '696 of oil composition having viscosities in the ranges claimed in claims 11-13 and 30-32 fails to disclose the features of the oil composition having similar viscosities of the present invention. Applicants submit that Liesen et al. '405 and Lai et al. '311 and Beimesch '696 fail to render obvious the present invention and the rejection should be withdrawn.

In view of the foregoing remarks, applicant respectfully submits that claims 1-20 and 22-37 of the present application are in condition for allowance and prompt favorable action is solicited.

Respectfully submitted,

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